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ABSTRACT

The two purposes of this study were (1) to explore the validity of certain indexes used to measure children's development toward maturity in the control of English syntax, and (2) to examine the characteristic exploitation of syntactic resources (a) by boys and girls, (b) at various age-grade levels, and (c) in speech and writing. The normative data was collected from taped oral responses or written language samples of 180 white middle class children, 30 each from kindergarten and grades 1, 2, 3, 5, and 7. Analysis was based on the mean length of the T-unit (a single, independent predication with all its complements and modifiers), which Kellogg Hunt (1964) claimed to be a discriminating indicator of the degree of syntactic mastery in children's language production. This study supported Hunt's finding. T-units were further analyzed for Chomsky's "sentence combining transformations." Results indicated that mean word length of total language production increases with every advance in grade level. The most significant increases in speech mastery were found in grades 1 and 7, and in writing mastery in grade 5. In grade 3 speech was better than writing, but this reversed in grades 5 and 7. Boys were better speakers than girls in all but grade 5. Girls wrote better than boys in the middle but boys surpassed them in seventh grade. (MH)

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A TRANSFORMATIONAL ANALYSIS OF THE LANGUAGE OF KINDERGARTEN AND ELEMENTARY SCHOOL CHILDREN

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A TRANSFORMATIONAL ANALYSIS OF THE LANGUAGE OF KINDERGARTEN AND ELEMENTARY SCHOOL CHILDREN*

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The investigation reported here had two general purposes. One was to explore the validity of certain indexes proposed as reliable, easily observable measures of children's development toward maturity in the control of English syntax. The other was to find out more about the characteristic exploitation of syntactic resources (1) by boys and girls, (2) at various age-grade levels, and (3) in speech and writing.

Numerous normative studies of children's language have been made, and some, such as that of Harrell (1957), have had several features in common with the one described here. The most nearly comparable previously reported investigation, however, is that of Kellogg W. Hunt (1964, 1965), who studied uniform amounts of writing produced under varying conditions by children in Grades 4, 8, and 12 in Tallahassee, Florida. Many of Hunt's procedures were followed in the present study, and the usefulness of his model is gratefully acknowledged. Insofar as the two investigations overlap, comparison of their results is particularly instructive.

Subjects for this study were 180 white middle-class children, 30 in kindergarten and 30 each in Grades 1, 2, 3, 5, and 7 in the Mitchell-Neilson School in Murfreesboro, Tennessee. Sexes were approximately equally divided in each grade-group. Standardized achievement scores and mean IQ's were closely comparable across groups, the latter indicating average intelligence. Age ranges

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within some groups were relatively wide; yet, mean ages of boy-girl subgroups in the six grades were identical or nearly so, except that the boys averaged about seven months older than the girls in Grade 7.

The corpus to be analyzed was collected in March, 1965. The language production consisted of reports and discussions of stories enacted in two eight-minute silent, animated cartoon films. Oral responses were recorded on tape for later transcription. Children in Grades 3, 5, and 7 produced written compositions immediately following their oral discussions. Directions and stimulus questions for writing were the same as those that elicited oral responses.

Having secured an accurate typescript of the corpus, investigators first cleared it of extraneous matter and then computed the mean length of total communicative responses in grade-groups and subgroups. Next, to establish a base for more refined measures, they segmented the responses into minimal terminal syntactic units (T-units), which Hunt (1964) had demonstrated to be less ambiguous and more useful than "sentences" as reference points for the description of children's writing. A T-unit is a single independent predication with its complements (if any) and all modifiers (including clauses) that are grammatically attached to it. T-units were found to be as readily identifiable in speech transcripts as in writing; informal interscorer reliability tests showed no discrepancies in judgments. Computations of word-length of T-units themselves constitute part of the data studied, and most of the other measurements applied to the corpus were related to these units.

Most important among those measurements were computations of the incidence of syntactic components of T-units that Chomsky, Lees, and others have called generalized or sentence-combining transformations. Since such

transformations increase the information-loading of the syntactic units that carry them, it was assumed that (within limits) their increased incidence normally reflects growth toward linguistic maturity. It was also assumed that use of a wide range of syntactic structures, with its implication of flexibility in the manipulation of language, is a mark of maturity, while constant, apparently indiscriminate employment of a particular construction at a frequency rate clearly exceeding adult norms would be attributable to immaturity.

Computations gauged the usage of grade groups in both speech and writing, and of male and female subgroups at each of the six grade levels. Differential results were usually subjected to statistical analyais of variance, and those here reported as "significant" should be understood to be statistically significant at the .05 level.

Like other investigators (most recently, Harrell, 1957, and Loban, 1963), we found that when groups of children respond to similar stimulus situations, the mean word length of total language production increases with every advance in grade level. Such increases were observed in writing as well as speech, though written compositions were consistently and markedly shorter than their oral counterparts. Measurement of mere volubility, however, produced a very distorted reflection of growth in linguistic mastery. Not only did all the other measures employed indicate superiority of the writing of fifth and seventh graders over their oral expression, but they showed that in speech the greatest advances in syntactic control were made in Grades 1 and 7, precisely the grades in which the smallest increases in total wordage occurred.

This investigation reinforced the contention of Hunt (1964) that "sentence" length is not a very dependable index of linguistic maturity, either--despite the

assertion of its virtues by McCarthy (1954) and others. Hunt found that excessive, inept use of coordinating conjunctions as bridges between independent predications led a number of fourth graders to write long "sentences" that were clearly less mature than the shorter sentences written by eighth graders. We found that in third grade writing the children in Murfreesboro introduced 25 per cent of their T-units with coordinating conjunctions (usually "and"), and that the incidence of such usage increased in Grade 5 but was markedly reduced in Grade 7. These observations closely parallel those made by Hunt in Tallahassee. But further, in speech we found that initial coordinations introduced more than half of the T-units of kindergarten children and that the rate of this usage increased steadily through the fifth grade but was reduced sharply in Grade 7. If (as seems probable) such behavior is characteristic of children, it is surely one explanation for the conclusion of Strickland (1962) that "length of phonological unit appeared . . . to be unsatisfactory as a measure of maturity of language."

Our findings, on the other hand, support Hunt's claim that the mean length of T-units may be a highly discriminating indicator of the degree of syntactic mastery achieved in children's language production. Word-length of T-units in each mode of expression increased with every advance in grade, but the significant increases in speech were found in Grades 1 and 7, while the significant increase in writing came in Grade 5. T-units were shorter in third grade writing than in third grade speech, but were longer in writing than in speech in Grades 5 and 7. These observations are consistent with evidence of developmental patterns derived from most of the other measures applied to the corpus. An important example of this consistency is the fact that the proportion of sentence-combining transformations to the number of T-units also increased

in each successive grade, and the significant increments in speech occurred in Grades 1 and 7. In writing, the relative increase in those transformations was significant in both the fifth and seventh grades, but the increase in Grade 5 was twice as great as that in Grade 7.

The pattern that emerged was that of relatively great development of syntactic control in speech in Grade 1, much slower (and often wavering) progress in the middle grades, and another impressive acceleration in Grade 7. In writing, development in the mastery of syntax was clearly marked in both the fifth and seventh grades, with the greater progress being evidenced in Grade 5. Children in Grade 3 had much firmer control of speech then of writing, but fifth and seventh graders demonstrated far greater maturity in writing than in speech. This pattern was three times repeated in counts of the whole array of sentence-combining transformations classified in the exhaustive (though overlapping) categories of nominal constructions, adverbial constructions, and coordinations within T-units.

It was repeated, too, in the data on use of most of the eighteen specific kinds of constructions identified within the three major categories. Some exceptions and some observations of relative magnitudes of increased use, however, may throw light on important aspects of children's language growth. Noun and adjective clauses, for example, were not found to have varied greatly in rate of use over the grade-span studied, except for a low incidence of adjective clauses in third grade speech and writing. But like other studies (those of Harrell, 1957, Templin, 1957, and Hunt, 1964, for instance), this investigation revealed impressive grade-to-grade increases in the relative frequency of adverbial clauses. In speech, the overall gain was more than 100 per cent, greatest increments

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coming in Grades 1 and 7; in writing, seventh graders used such clauses nearly twice as often as third graders did, though not much more frequently than did fifth graders. Adverbial clauses were used at a significantly higher rate in writing than in speech in Grades 5 and 7.

Gains in the use of adverbial clauses in speech, however, were not significant at any particular point when one grade group was compared with that immediately below it. Nor, in either mode of expression, were increments in adverbial clauses so great over the grade range as were increases in use of certain types of transformations requiring application of deletion rules. In contrast with adverbial clauses, too, such transformations as those producing sentence adverbials, adverbial infinitives, coordinate constructions within T-units, and the modification of nouns by participles or prepositional phrases often showed significant increments from grade to adjacent grade. Remembering, now, that there was little grade-to-grade change in the incidence of nominal and adjectival clauses, we may be led to question the relative usefulness of the "subordination ratio," which has been (in several adaptations) a favorite device for gauging children's language development ever since it was first proposed by LaBrant (1933).

A number of differences in language behavior correlated with sex were observed. They do not, however, support the popular notion that the language growth of girls naturally and consistently outruns that of boys, an idea fostered by McCarthy's review (1954) of the earlier literature on children's language development. In speech, the boys who were subjects in this investigation were evidently superior to the girls in the handling of syntax in every grade except Grade 5. Over all grades, boys used significantly longer T-units, and they used

fewer such units shorter than nine words in kindergarten, Grade 2 and Grade 7. The incidence of sentence-combining transformations was also higher in speech of boys than in that of girls, though at no point was the difference significant. The boys' rate of use of transformation-produced nominals, however, was significantly higher, and their use of coordinations within T-units was consistently greater, though the difference attained significance only in Grade 7.

In writing, however, a different situation was apparent. In Grade 3 the syntactic control of girls was clearly superior to that of boys, and this relative position was maintained in Grade 5. In Grade 7, however, the boys had caught up to the girls, and in a number of respects had surpassed them. These generalizations are consistently supported by computations of average length of T-units, the number of short T-units, the mean numbers of sentence-combining transformations within T-units, and the incidence of most of the specific types of syntactic constructions identified for study. Among specific constructions, the pattern described was most sharply outlined in the incidence of transformations within nominals, which was significantly higher for girls in Grades 3 and 5 and was significantly higher for boys in Grade 7.

It may, of course, be argued that the record of the boys in Grade 7 was affected by their being somewhat older than the girls in that grade. However. that may be, the whole body of data on sex differences indisuputably indicates two conclusions: (1) in the population studied, the boys certainly did not lag behind the girls in oral language development, but in a number of respects appear to have led them; yet (2) the girls acquired skill in writing much more rapidly than the boys did. These observations may raise the questions of whether motor skills involved in writing were an initial handicap for boys, or whether the curriculum

and methods of teaching were better suited to developing writing skills in boys than in girls.

These and other questions suggested by this study have crucial educational importance if the findings of this investigation are generalizable. Are children in about their seventh and thirteenth years, for example, best fitted by nature to expand their productive mastery of syntax rapidly? If so, the design of the school program should take maximum advantage of natural propensities at those stages. But perhaps the slower development in the middle grades is a function of kinds of experiences children have in school (and out). The observed great advances in syntactic mastery in fifth grade writing casts doubt on the interpretation that children are naturally more susceptible to acquisition of language control at the extremes of the elementary school range. Presumably, children rapidly develop writing skills betweer the end of Grade 3 and the end of Grade 5 because teachers at that stage deliberately focus their attention on such development. It may be that concentration of concern on writing reduces attention to oral expression. We may question whether more serious exploration ought not to be made to discover ways to continue the expansion of mastery of syntax in oral expression. It is gratifying to find control of writing proceeding so rapidly in the upper grades, but that it exceeds such control in speech by the end of the seventh grade may not be an unmixed blessing.

This study provides data not only on types of grammatical patterns and constructions frequently used at every grade level by the children sampled and on those whose rate of use increased substantially over the grade span studied, but also on those infrequently used and on those whose use did not increase markedly with advances in grade level. It provides, of course, no direct evidence about

the processes involved in children's learning to exploit the resources of their language. We need to learn a great deal more than we now know about those processes, about the hierarchy of difficulty in acquiring command of the various syntactic constructions, and about how such acquisition can be facilitated. Like certain other normative studies of children's language, such as that of Hunt, this investigation may be most useful in its identification of points at which explorations of the learning processes might be most profitable, and in the indication of some directions the explorations might take.

Annex to a Report on

A Transformational Analysis of the Language of Kindergarten and Elementary School Children*

General purposes of the investigation:

(1) to explore the validity of certain indexes proposed as gauges of children's development of productive control of English syntax;
(2) to identify characteristic differences in the exploitation of syntactic resources (a) by boys and girls, (b) at various age-grade levels, and (c) in speech and writing.

Features that, in their combination, mark the investigation:

(1) uniformity of stimulus conditions under which speech samples were elicited from boys and girls in kindergarten and in Grades 1, 2, 3, 5, and 7; hence, comparability of language responses studied;
(2) collection, under as nearly as possible the same uniform conditions, of written as well as oral responses from children in Grades 3, 5, and 7;
(3) analysis of the corpus by means of a system based on principles of transformational grammar, attention being focused on sentence-combining transformations;
(4) application of most of the measures adopted to a basic syntactic unit that was clearly defined and reliably identified.

Subjects:

One hundred eighty white middle-class children of average intelligence in Murfreesboro, Tennessee, the 30 members of each of six grade-groups being approximately equally divided as to sex.

Procedure:

Language samples were collected in March, 1965. Subjects viewed two silent, animated motion picture cartoons that were adaptations of Aesop's fables. At the end of each eight-minute film, each child was asked to relate the story he had seen, and then to respond to a simple set of pre-planned questions intended to elicit his interpretations and applications of the fable. Oral responses were recorded on tape. Children in Grades 3, 5, and 7 produced written compositions in response to the same directions immediately subsequent to their oral discussions.

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*This study was conducted by Roy C. O'Donnell with the guidance and assistance of William J. Griffin and Raymond C. Norris. It was a project of the School Learning Institute of George Peabody College for Teachers, and was supported by funds granted by the Carnegie Corporation of New York. The investigators are solely responsible for statements made and views expressed in this report.

Having secured an accurate typescript of the corpus, investigators first marked off for separate computations such extraneous matter as audible pauses and the incoherencies that in related studies have been variously called "word-tangles," "mazes," and "garbles." Both oral and written responses were then segmented into "minimal terminable syntactic units" (T-units). T-units were analyzed to identify syntactic components that could be accounted for as sentence-combining transformations. Such components were classified in both major and subordinate categories. Syntactic patterns of main clauses were also identified and classified, but the results of that procedure are not dealt with in this report.

The following aspects of the corpus were studied, but only those marked with an asterisk (*) are touched on in this report.

1. Incidence of audible pauses in speech, and of "word-tangles" in speech and writing.
*2. Total word-length of individual responses in speech and in writing (excluding estraneous matter).
*3. Word-length of T-units; incidence of short T-units (less than nine words long).
*4. Sentence-combining transformations affecting T-units; proportions of such transformations to the number of T-units produced.
   *a. Coordinating conjunctions introducting T-units.
   *b. Transformations producing nominals or syntactic elements within nominals.
      *(1) Twelve types of nominal constructions produced by those transformations--eight headed constructions and four non-headed constructions.
      (2) Eight grammatical functions (those of subject, direct object, etc.) of nominal constructions generated by those transformations.
   *c. Transformations producing adverbial constructions, subdivisions of this category being adverbial clauses, adverbial infinitives, and sentence adverbials.
   *d. Transformations producing coordinations within T-units, subdivisions of this category being coordinate nominals, coordinate modifiers, and coordinate predicates.
5. Structural patterns of main clauses.
   a. Eleven structural patterns of grammatically complete main clauses.
   b. Grammatically incomplete main clauses.

Computations were made for each grade-group and for male and female subgroups within the grades, writing being studied separately from oral language production. Sex and grade differentiations were thus studied at six grade levels, while a three-dimensional design allowed comparison of oral and written language of boys and girls in Grades 3, 5, and 7. Computations were, for the most part, performed by means of an IBM 7072 electronic data processing system. Statistical analysis of variance

was executed to test for significance at the .05 level. Procedures in testing for statistical significance were those described by Lindquist (1953), pp. 207-214, 281-284. Appropriate subanalyses were made where necessary to clarify the nature of the more complex relationships.

Explanations of special terms:

"Extraneous matter"

"Audible pauses" are vocalized hesitation signals such as are often represented in writing by "uh" or "a--a."

"Word-tangles" are abnormal redundancies ("This man I was telling you about, he said . . . ."), false starts ("The North Wind asked the Sun to for an answer"), or incoherencies of other types (example: "The ant went back home and into a bed but under he went to bed under warm blankets").

"Minimal terminable syntactic units (T-units)" are defined as single independent predications with their complements (if any) and whatever modifiers (including clauses) may be grammatically attached to them. Hunt (1964) describes them as "the shortest segments which it would be grammatically allowable to write with a capital letter at one end and a period at the other, leaving no fragment as residue." Thus, My uncle, the man you met last night, married early and had ten children, all of whom did well for themselves(.) is one T-unit; but John laughed and Mary cried(.) contains two T-units. A coordinating conjunction that joins two independent predications is naturally regarded as belonging to the second T-unit.

"Sentence-combining transformations" are components of a syntactic construction regarded as converting a pair of sentences into a single sentence by embedding one in the other. Thus, for example,

The man was poor.
The man bought an automobile.

may be combined as The poor man bought an automobile(.) or The man who was poor bought an automobile(.) or Though the man was poor, he bought an automobile. Any of those sentences, of course, could be further combined with such a sentence as

The automobile was expensive.

to produce statements like The poor man bought an expensive automobile. Such transformations obviously increase the information-load of the syntactic units they produce. Hence, the child's demonstrated ability to use them freely may be supposed to reflect an important aspect of development toward maturity in language behavior.

"Deletion rules" are rules for producing transformations involving the reduction of certain elements in the base sentence that is embedded in another sentence. The first and last examples of transformations above, for example, were the results of applying deletion rules; in the second example, however, who was poor required substitution of the appropriate relative pronoun for the original subject (the man), while in the third example a subordinator was added to introduce the sentence that was turned into a modifier. Deletion rules produce (among other constructions) coordinate nominals, coordinate modifiers, and coordinate predicates, but not the coordination of whole predications which young children use with a frequency far greater than is characteristic of normal adult usage.

A Partial Summary of Findings:

1. Comparison of language production at various grade levels.
   a. Mean length of total responses in both speech and writing increased with every advance in grade level. In speech, the increases were notably greater in Grades 2, 3, and 5 than in Grades 1 and 7; in writing the larger increase was observed in Grade 5. Written compositions were less than half as long as oral responses in Grade 3, were about three-fifths of the length of oral responses in Grade 5, and were about seven-tenths as long as oral responses in Grade 7.
   b. Word length of T-units increased with every advance in grade level, but in the comparison of adjacent grade levels significant increments in speech were found only in Grade 1 and Grade 7; in writing, only the increment in Grade 5 was significant.
   c. The proportion of sentence-combining transformations to T-units also increased at least slightly in every successive grade, but in speech the increments were significant only in Grade 1 and Grade 7; in writing, the increases were significant in both the fifth and seventh grades, that in Grade 5 being more than twice as great as that in Grade 7.
   d. Except for a slight reduction of coordinate constructions in seventh grade writing, overall increases across the grade range were observed in frequencies of transformations producing nominal constructions, adverbial constructions, and coordinations within T-units in both modes of expression. In speech, the increments in all three categories were significant in Grade 7, and those in nominal and adverbial constructions were significant in Grade 1. Despite some fluctuations, there were general increases in the use of all three of these construction types in the middle grades. In writing, increases in the use of nominal and adverbial constructions produced by transformations were significant in both the fifth and seventh grades, as was the increase in coordinations within T-units in Grade 5.

e. Though transformations producing nominal constructions were at all grade levels much more frequent than those producing adverbial constructions and coordinations within T-units, the overall increase in those coordinations was about twice as great and the overall increase in the adverbials was about three times as great as the overall increase in transformation-produced nominals.
f. The incidence of adverbial clauses increased by 100 per cent in speech between kindergarten and Grade 7, and by the same amount in writing between Grade 3 and Grade 7. Noun clauses and adjective clauses, however, did not greatly vary in frequency over the grade-span studied, except for a remarkably low incidence of adjective clauses in third grade writing.
g. Sentence-combining transformations that showed the most consistent and impressive gains over the grade-span studied were those whose production involves deletion rules. Specific constructions containing such transformations were sentence adverbials, coordinate modifiers, coordinate predicates, and nominals in which adjectives, participles, or prepositional phrases modified a noun head.
h. Certain constructions produced by sentence-combining transformations appeared sporadically but showed no clear pattern of increasing frequency over the grade-span. Such were the gerund phrases and the modifications of nouns by infinitive phrases or adverbs.
i. The rate of coordination of main clauses was (by adult standards) very high in kindergarten, and it was increased in speech in every succeeding grade except Grade 7, where it was reduced. In writing, the frequency rate of such coordination in Grade 3 was about one-third as high as in third-grade speech. The rate increased in fifth-grade writing but was reduced in the writing of seventh graders.

2. Comparison of oral and written expression.
   a. Striking differences between speech and writing at three grade levels are shown in the following chart, where differences tested and found significant are marked with an asterisk:

	Grade 3		Grade 5		Grade 7	
	Speech	Writing	Speech	Writing	Speech	Writing
Mean word-length of responses	510.3	225.6	656.0	387.5	748.0	536.6
Mean word-length of T-units	*8.73	7.67	8.90	9.34	9.80	9.99
Per cent of T-units fewer than 9 words long	60.31	69.67	60.78	51.75	54.22	47.50
Mean number of s-c transformations per T-unit	1.01	.92	1.05	*1.41	1.34	*1.61
Incidence of initial coordinating conjunctions: rate of use per 100 T-units	72.67	25.37	81.25	29.05	75.05	23.08
S-c transf. in nominal csts.: rate of use per 100 T-units	61.79	58.49	62.27	*73.37	74.69	*94.06
S-c transf. in adv. csts.: rate of use per 100 T-units	15.33	13.01	14.89	19.03	19.59	24.29
Coordinate csts. within T-units: rate of use per 100 T-units	23.09	20.35	28.03	*44.61	38.71	41.81

b. Among subtypes of nominal constructions formed by sentence-combining transformations, some reflected notable differences in speech and writing. Genitive forms modifying nouns were relatively more frequent in third grade speech than in third grade writing, while their rate of use was significantly greater in the writing than in the speech of fifth and seventh graders. Participial modification of nouns occurred at a higher rate in writing than in speech at all three levels, and the difference was significant in Grade 7. Infinitives with subjects appeared at a higher rate in speech than in writing of third graders but at a higher rate in writing than in speech in both upper grades, and the overall difference in favor of writing was significant. Gerund phrases had a higher incidence in speech than in writing in Grade 3, but they occurred at a higher rate in writing than in speech in the other two grades, the difference being significant in Grade 7.

c. Adverbial clauses were used at a higher rate in speech than in writing by third graders, but they occurred at a significantly higher rate in writing than in speech in Grades 5 and 7. The rate of occurrence of adverbial infinitives was higher in speech than in writing in Grades 3 and 5, but it was significantly higher in writing than in speech in Grade 7. Sentence adverbials were used at a higher rate in speech in all three grades, and significantly so in Grade 3.

d. Coordinate predicates occurred at a significantly higher rate in writing than in speech in Grades 5 and 7, though their relative frequency was greater in speech than in writing in Grade 3. The only apparently notable difference in the use of coordinate nominals and coordinate modifiers was the significantly higher rate of use of coordinate nominals in seventh grade writing.

3. Comparison of the language of boys with that of girls.
   a. Oral responses of boys were longer than those of girls at all levels except in Grade 5; the differences were significant in Grades 3 and 7. In writing, girls produced longer compositions than did boys in Grades 3 and 5, but the relations was reversed in Grade 7.
   b. Mean-length of T-units in the boys' speech was greater than that in the speech of girls in every grade except the fifth, and the differences were significant in kindergarten and Grade 7. In writing, the mean length of T-units produced by girls was non-significantly greater than the mean length of those produced by boys in Grades 3 and 5, but the relation was reversed in Grade 7. Short T-units (fewer than nine words long) were more frequent in the writing of boys in Grades 3 and 5, but not in Grade 7.
   c. Sex differences in mean numbers of sentence-combining transformations per T-unit exactly paralleled the pattern observed in the word-length of T-units in both speech and writing, except that the differences were at no point significant.
   d. Coordinating conjunctions at the beginning of T-units were more frequent in the speech of girls except in kindergarten and Grade 3; in writing they occurred more frequently in the expression of boys in Grades 3 and 5 and of girls in Grade 7.
   e. Transformation-produced nominals were used in speech at a significantly higher rate by boys than by girls. In writing, girls used these nominals much more frequently than did boys in Grades 3 and 5, but the difference in favor of the boys in Grade 7 was still greater.
   f. Boys generally used noun clauses at a higher rate in speech than girls did (four times as frequently in kindergarten); but in writing, girls used them twice as often as boys did in Grades 3 and 5.
   g. Boys used coordinate constructions within T-units in speech at consistently higher rates than did girls, and the difference was significant in Grade 7. In writing, the boys used such constructions much more frequently than did girls in Grade 5 and a little more often than did girls in Grade 7.
   h. Fluctuations rather than consistent sex differences were observed in the use of the whole class of adverbial constructions produced by sentence-combining transformations. Girls, however, used adverbial clauses more frequently than boys did in both speech and writing in the three upper grades, except in seventh grade writing. The difference in favor of the girls was significant in fifth grade writing.

<u>Some generalizations and interpretations.</u>

1. General indexes of maturity in syntactic control. The observed excessive use of coordinations of main clauses, apparently not restrained before the end of the fifth grade, emphasizes one of the explanations given by Hunt (1964), for the defectiveness of mean length of sentences as a measure of linguistic maturity, despite the

assertion of its virtues by McCarthy (1954) and others. The particularly high frequencies of such coordinations in speech no doubt account (in part, at least) for the conclusion of Strickland (1962) that "length of phonological unit appeared . . . to be unsatisfactory as a measure of maturity of language." This study also demonstrated that length of total responses gives a very distorted reflection of development in syntactic control.

Sensitive general measures of children's development toward maturity in the productive management of syntax in both speech and writing appear to be (1) the mean length of T-units and (2) the mean number of sentence-combining transformations within T-units relative to the number of T-units produced. These measures were demonstrated by Hunt (1964) to be meaningful in the description of children's writing.

Among specific types of syntactic constructions produced by sentence combining transformations, those formed by application of deletion rules appear to reflect growth toward maturity much more clearly and consistently than do subordinate clauses. This observation casts doubt on the usefulness of the "subordination ratio" that has been (in several adaptations) a favorite device for gauging children's development of syntactic control ever since it was first proposed by LaBrant (1933).

2. Stages in children's development of syntactic control. The evidence accumulated in this investigation clearly indicated that in speech the children in Grades 1 and 7 made the greatest advances toward maturity in the exploitation of syntactic resources of the language, though various developments were reflected in the middle grades. This observation raises the question of whether children in about their seventh and thirteenth years are naturally more capable of expanding their mastery of language or whether the less impressive advances in the middle grades may be accounted for by the quality of experiences children have in school (and out of school). Whatever the explanation, if the findings related to the population studied are generalizable, they have important educational implications.

   It is not surprising to find that children in the two highest grades studied showed themselves to be very greatly superior to third graders in the management of syntax in writing. The fact that greater advances were evidenced in the fifth than in the seventh grade, however, may suggest the particular importance of the fourth and fifth grades in the teaching of writing skills, or it may indicate that the school program was not so appropriately designed to push forward the development of writing in grades six and seven.

3. Syntactic differences between speech and writing. An especially interesting (and probably important) outcome of this investigation is its demonstration that in the population studied syntactic mastery was clearly inferior in writing to that in speech in the third grade, but that in the seventh grade it was equally clearly superior in writing. The cross-over in relative degrees of skill in the two modes of expression speaks well for the success of training experiences in writing, but it may also reflect undesirable neglect of development of oral skill in the upper grades.

4. Sex differences in the handling of syntax. On many counts, the boys in the population studied demonstrated a somewhat higher degree of mastery of syntax in oral expression than did girls in kindergarten and at every succeeding grade level except Grade 5. The differences in favor of the boys were most clearly marked (and most often significant)in kindergarten, Grade 3 and Grade 7. The interpretation of these observations should take account of the fact that the mean age of boys was the same as that of girls in kindergarten and Grade 5, was two months lower than that of girls in Grade 1, was one month higher than that of girls in Grades 2 and 3, and was seven months higher than that of girls in Grade 7. The sex-differentiated findings in Grade 7, therefore, may need to be discounted. Nevertheless, this study does not support the notion, expressed by McCarthy (1954) and popularly assumed to be true, that the language development of girls characteristically outruns that of boys. An implication here is that expectations of achievement should not be based on that notion.

In writing, it is true, the observations made in this investigation indicated that girls were clearly superior to boys in their management of syntax in Grade 3 and Grade 5. The relative positions of the sexes in syntactic skill in writing were just as clearly reversed in Grade 7, but it may be argued that the reversal is at least in part a function of greater age of the boys. What is not arguable is the fact that in the population studied, girls acquired skill in writing much more rapidly than the boys did. It would not be surprising to find that the population is in this respect typical of elementary school children generally. If so, are the sex differences related to characteristic differences in motor control? Or are the curricula and the methods of teaching in the elementary school better suited to the development of writing skills in girls than in boys?

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